

Application of Spaceborne Scatterometer to Derive Hydrologic Forcing and Pressure Loading on the Ocean

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The advent of spaceborne microwave scatterometers has greatly increased the number and coverage of wind observations over the ocean. The scatterometer winds could be used to improve the estimation of atmospheric pressure over the undersampled Southern Oceans. Geostrophic winds at the top of the planetary boundary layer are estimated from surface wind fields derived from ERS 1 scatterometer data with a boundary layer model which is based on similarity theory and includes the effects of stratification, secondary flow and thermal wind. With the inclusion of a few in situ observations, pressure values can be derived from the geostrophic winds, using an inverse method. Large differences between pressure derived from scatterometer winds and from operational numerical prediction models are found and the differences are being carefully examined, comparing with independent sets of observations. Pressure loading strongly affect changes in sea level. Any improvement is timely to the Topex/Poseidon Project, the main objective of which is to measure sea level change to a high degree of accuracy. The scatterometer winds were also used to improve the estimation of the surface wind divergence, the omega (vertical velocity in pressure coordinate) profile and, therefore, the hydrologic forcing over the tropical ocean. Obvious improvements on the analysis of the European Center of Medium Range Forecast were found when the scatterometer ground-tracks passed over TOGA-COARE (Coupled Ocean Atmosphere Response Experiment) intensive Flux Array, where high quality soundings and precipitation-evaporation were measured. This study demonstrates the application of scatterometer wind field beyond its core objective of studying wind-forced ocean circulation. The scatterometer will be a powerful complement to other EOS sensors, such as, the microwave altimeter and TRMM (Tropical Rainfall Measuring Mission) in the study of hydrologic balances.